

# UNCLASSIFIED

|  |
|--|
|  |
|  |
|  |
|  |
| AD NUMBER  |
| AD400995   |
| NEW LIMITATION CHANGE  |
| TO<br>Approved for public release, distribution unlimited  |
| FROM<br>Distribution authorized to U.S. Gov't. agencies and their contractors; Foreign Government Information; 20 JUN 1961. Other requests shall be referred to US Library of Congress, Attn: Aerospace Technology Division, Washington, DC. |
| AUTHORITY  |
| ATD ltr, 2 Dec 1965  |

THIS PAGE IS UNCLASSIFIED

400995

STEP  
11.9600  
11.390044050  
S/676/62/009/000/003/010  
A006/A101

AUTHOR: Chayevskiy, M. I.

TITLE: Some generalizing conclusions on the effect of liquid metal melts upon the strength and ductility of metals

PERIODICAL: Akademiya nauk Ukrayins'koyi RSR. Instytut mashynoznavstva i avtomatyky, L'viv. Nauchnyye zapiski. Seriya mashinovedeniya. v. 9, 1962, Voprosy mashinovedeniya i prochnosti v mashinostroyenii, no. 8, 22 - 29

TEXT: The authors carried out an experimental investigation which makes it possible to generalize the effect of temperature, deformation rate and melt type upon the strength and ductility of metals which are in contact with liquid metal melts. The deformation, leading to the breakdown of a steel specimen, which is in contact with a liquid metal melt, can be lesser or greater than the deformation required for the failure of a specimen in air. The former case corresponds to embrittlement, the latter to plasticizing. Brittle failure of steel under the effect of a low-melting metal melt is only observed during the diffusion of the

Card 1/3

metal melt into the steel volume; it is, as a rule, accompanied by reduced fatigue strength. Embrittlement increases at a longer contact with the melt, higher temperatures and at a reduced deformation rate. In melts which do not diffuse into strained steel specimens, a plasticizing effect may arise at elevated temperatures and reduced deformation rate. The critical transition temperature from brittleness to ductility depends on the type of strained state, deformation rate and the melt type. Therefore, both effects can be observed for various steel grades, depending on the selection of the aforementioned factors. Carbon and low carbon steels 2X13 (2Kh13) and 1X18H9T (1Kh18N9T) can satisfactorily operate in contact with Na, K, Hg, Pb, Sn and Bi type melts and Pb-Sn, Pb-Bi, Na-K eutectics under static load and at definite temperatures; the deformation should not exceed critical values in order to prevent diffusion of the melt into the metal volume. Under cyclic loads, the fatigue strength increases, if melts of Sn and Pb-Sn eutectics are used, in particular, for specimen with a sharp stress concentrator. Carbon steel parts in contact with Pb-Sn eutectics can operate under cyclic loads at up to 400°C, and 1Kh18N9T steel parts at up to 500°C. The effect of low-melting metal melts on cyclic-deformed steel depends mainly on the deformation rate. A sharp decrease of this factor may fully eli-

Card 2/3

minate the embrittling effect of the Pb-Sn melt even in the case of alternating plastic deformation of the steel. The investigation shows that steel parts can operate without breakdown if the metal melts are properly selected. There are 3 figures.

SUBMITTED: June 20, 1961